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The demographic crisis in Europe – "Immigrants, welcome!"

A quantitative study of fertility and migrations rates in 27 European states 1997 and 2017

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Abstract

The present study examines whether the demographic components *fertility* and *migration* are related among 27 European countries. From the 1970s fertility levels have decreased and the life expectancy has risen, which has led to both *ageing* and *shrinking* populations sizes in Europe. The United Nations (2000) and the European Union (2006) have thus recommended immigration as one solution to address the population decline. By performing cross-sectional analyses, this study investigates the statistical association between total fertility rates and net migration rate per capita in 1997 and 2017. The general finding is that fertility levels do not have any effect on migration rates both years. This implies that migration is mainly shaped by other incentives such as push and pull factors and not by levels of fertility. The results show however two positive associations in 1997, which is an outcome of Cyprus and Malta's strong impact in the regression analyses due to the countries' different levels of fertility and migration in comparison to the other twenty-five countries here. In addition, higher economic development associates with higher migration rates in both 1997 and 2017 and the southern regimes have the highest migration rates in 1997 among the welfare state regime types.

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Table of content

Tables and Figures

1. Introduction and Background

Population structure depends on three components: fertility, mortality and migration. During the last hundred years European societies have faced dramatic changes in these three demographic domains and the current study will focus on fertility and migration rates[1]. Today European states face the two demographic challenges *population decline* and *population ageing* due to continuously low fertility levels together with increased longevity. The population size of the European Union (EU) is expected to decrease from 493 million inhabitants in 2010 to 472 million by 2050 which is the lowest population growth among the world regions (van Nimwegen & van der Erf, 2010 p. 1359-1360).

Birth rates have steadily declined in the aftermath of what has been called the "baby boom"-period after World War II (McDonald & Kippen, 2001 p. 1). The large cohorts[2] born in the 1950s and 1960s have caused *below replacement level* in Europe, which means that the number of new-borns does not reach the amount of people of the former generation. In order to renew the population size the suggested total fertility rate (TFR) is 2.1 births per woman for all member states of the European Union (EU) (COM(2005) 94). However, the average has been and is around 1.5 (World Bank data, 2017a). In several countries such as Italy and Spain levels of 1.3 births per women have generated the term "lowest-low" – levels within the research field (Billari & Dalla-Zuanna, 2011 p. 105; Baird et al., 2010 p. 592). The overall decline of fertility levels is not only a result of fewer births, but also an effect of the postponement of family formation in Europe (Billari, 2008 p. 4; van Nimwegen & van der Erf, 2010 p. 1263-1264). The absolute number of births plays a significant role in population dynamics whereas the size of a birth cohort eventually becomes the labour force of a country (Billari & Dalla-Zuanna, 2011 p. 106). The big baby-boom cohorts will soon put pressure on fiscal sustainability because the proportion of elderly will be larger at the same time as the share of citizens in working-age will be smaller[3]. Therefore, European national governments will have to increase retirement ages and tax rates, cut pensions and make health care provision more efficient (European Union, 2000 p. 91; Goldstein & Kluge, 2016 p. 302-303). The literature refers to these

[1] Mortality levels as a component will be left out because of its limited role on population growth whilst fertility and migration have a direct impact to population growth/decline (Wilson et al., 2013 p. 131).
[2] Definition of cohort: A group of people with common characteristics. Often used for statistical purpose. In this research field cohort refers to the group of people born the same year (Collins Dictionary, 2020).
[3] See demographic pyramid 2016 and 2080 of the EU population (Eurostat, 2017) in Appendix 1.

fundamental upcoming challenges for European welfare states as *a demographic crisis* (Berg & Spehar, 2011 p. 25, 100).

International migration is a key determinant of population sizes and has become a main driver for the overall population growth in Europe in the absence of increasing fertility levels (van Nimwegen & van der Erf, 2010 p. 1362). The United Nations (UN) published a report in 2000 that recommended an enormous increase of immigration to the then fifteen EU member states among other world regions. The report founded the term *replacement migration*, which implies to the amount of international immigration needed to counteract declining and ageing population sizes (UN, 2000 p. 7). The two main ambitions regarding the EU were to (1) keep the size of the working-age population and to (2) maintain the potential support ratio[4] (PSR) at 1995 levels by 2050. To maintain the size of the group of people in working-age an average of 1.4 million immigrants every year between 1995-2050 was proposed, and 12.7 million immigrants were required to manage the PSR constant (European Union, 2000 p. 90-91). Also, the EU Commission (2006) report stated that a net annual migration rate of 1 million immigrants over the next forty years is needed to secure the demographic balance of the EU (COM(2006) 571). Besides, The European Bank Federation states that fertility rates ought to increase to secure the same levels of labour force participation based on concerns regarding competitiveness on the global market and public finance (Lutz & Skirbekk, 2005 p. 699).

From the 1990s onwards five major events have occurred that have had a major impact on migration in Europe. The first event was the fall of the Soviet Union, which led to East-West migration. This was followed by the war in former Yugoslavia, which caused large numbers of refugees. Thirdly, there was the Eastern enlargement of 12 new EU member states in 2004 and 2007, which again generated East-West migration and the fourth event was the financial crisis of 2008. The recession led to a decline in international immigration while the intra-European migration increased from the worst hit countries towards those that managed better (de la Rica, Glitz & Ortega, 2019 p. 1307). Lastly, the so-called refugee crisis in 2015 generated large international immigration flows to the EU (Winter, 2019 p. 2).

[4] Potential support ratio: number of people aged 15-64 (working-age) for each person aged 65 or older (elderly) (European Union, 2000 p. 89).

1.1 Aim

Higher birth and migration rates are two solutions to combat the demographic crisis in Europe. Both the UN (2000) and the EU Commission (2006) advocated that immigration is needed to address the problem of shrinking population sizes due to the low fertility levels in Europe. This study contributes with an understanding of whether fertility and migration rates are associated and to what extent among 27 European member states the years 1997 and 2017 before and after several large-scale migration flows.

1.2 Disposition

This study contains six sections. The next section, section 2, presents theory and previous research on fertility and migration rates. The research question and hypothesis follow. Section 4 discusses the choice of method and data, the selection of countries and years, and variables in the study. In section 5, the results are presented. Finally, the concluding discussion and suggestions for further research are provided in section 6.

2. Theory and Previous Research

2.1 Theory

The major line of literature that studies the association between fertility and migration is that of replacement migration. The replacement migration literature asserts that immigration flows can substitute “missing” births in shrinking population sizes. I will present the main studies regarding replacement migration mainly in European states, which have been carried out by Billari (2008), Billari & Dalla-Zuanna (2011), and Wilson et al. (2013). After presenting this approach I will give examples of critics, which argue that the idea of higher immigration as a solution to decreasing population sizes as proposed by the UN (2000) is too simplified and unrealistic. Further, the literature on fertility and migration will be presented in order to stress that the association could be in the opposite direction since this thesis do not examine the causality. I will then introduce various established push and pull factors, which explain incentives behind cross-country differences in immigration levels in Europe. Finally, a short discussion is presented of the welfare state and migration, as well as the effect of women’s labour market participation on the demographic structure.

The thesis intends to examine whether fertility levels associate with migration rates in the years 1997 and 2017 at a European-level by investigating twenty-six existing European member states plus the United Kingdom. Cross-sectional studies and regression analyses with 3 control variables will be carried out to find out to what extent fertility and migration might relate. The net migration rates include five-year estimates collected from the World Bank database and will thereby cover two periods in our recent history that have been strongly influenced by high migration streams. It should be noted that this is neither a study of replacement migration nor an analysis of a new pull factor. The results aim to give us insight into if and to what extent two out the three demographic pillars: fertility and migration, are statistically associated.

2.2 Replacement migration

Replacement migration has become a broad label for when immigrants "replace" missing births and was introduced in the UN's report in 2000 (Billari & Dalla-Zuanna, 2011 p. 106, UN, 2000). Billari (2008) claims that replacement migration has occurred amongst the 21 largest member states of the EU. Countries that had the largest decrease in fertility levels between the cohorts born in 1964 and 1984 experienced the highest rates of immigration twenty years later in 2004. In other words, Billari (2008) found statistical proof for a negative correlation between fertility and migration rates on a European-level. This 40-year perspective (between 1964 and 2004) illustrates firstly the differences of numbers of births between the mothers' cohorts in 1964 to those of their children in 1984. Secondly, 20 years later in 2004 net migration rates were analysed in order to frame the labour market needs by the time the cohorts of 1984 became 20 years old and presumably had entered the labour market. Italy and Spain were the two countries with extremely low levels of fertility and very high rates of immigration in 2004, which affected the result of replacement migration (Billari, 2008 p. 12, 14, 16). In a second study, Billari & Dalla- Zuanna (2011) look closer at Spain and Italy which have had a TFR under or around 1.3 since the 1990s and found that by the beginning of the 21st-century immigrants stopped the population decline despite the consistent lowest-low fertility levels. This being said, Italy and Spain experience a "zero population growth" by means of replacement migration (Billari & Dalla-Zuanna, 2011 p. 105). In addition, they claim that *birth-cohort replacement migration*[5] has occurred in Spain, the UK, and the United States while not in Italy, Germany, France, South Korea, or Japan (Billari & Dalla-Zuanna, 2011 p. 108).

Wilson et al. (2013) point out that regardless of the importance of studies of replacement migration there is not yet any typical standard for measuring it. They argue that migration is an unstable segment of demographic studies because data is given annually and collected differently between countries, resulting in long-term ambiguous predictions. There is also a lack of demographic forecasts due to the uncertainty about who will migrate, and thereby which group of the native population the immigrants eventually will replace. That being said, immigrants have frequently been shown to be mostly young teenagers or in working-ages (Wilson et al., 2013 p. 133-134). Specifically, labour migrants often move as young adults and can therefore contribute to cohorts of women aged 15 to 30 in Europe (Simpson, 2017 p. 7).

[5] Birth-cohort replacement migration compares the size of birth cohorts as it ages to the fixed cohort of the mothers at the time the babies were born (Billari & Dalla-Zuanna, 2011 p. 108; Wilson et al., 2013, p. 134).

Wilson et al.'s (2013) show how *intergenerational replacement*, as they rather like to call it instead of the questionable term replacement migration, has taken place in European countries. They examine *population replacement* by investigating selected birth cohorts between 1972-1995 and follow them up until 30 years of age (or until 2011) amongst the EU-15 countries[6]. Population replacement refers to how migration alters the size for either a certain age-specific cohort or a whole population and does not calculate for biological reproduction [7]. Hypothetically, a population that has encountered population replacement can have no domestic births, but only a huge inflow of migrants and thus be replaced by migration. They choose the cohort of 1972 as the earliest year because by that time TFR was falling below replacement level for the first time. They use the *overall replacement ratio* (ORR) that examines the impact of female birth cohorts locating in the new country divided by the average annual size of the mothers' cohorts already living in the country (Wilson et al., 2013 p. 134-135). Their findings show how the ORRs moves in upward trends on average in the EU (EU-15) to levels of intergenerational replacement as each cohort ages due to female immigrants. The younger cohorts born in 1990 and 1995 indicate that population replacement will be reached in the upcoming short future. In addition, they show that Belgium, France, Sweden, Switzerland, the UK, Italy, Spain, Czech Republic, and Hungary have levels of migration that have led far beyond population replacement while cohorts in Germany, Bulgaria, and Latvia had not reached levels of population replacement (Wilson et al., 2013 p. 138, 142-145, 149). Wilson et al. (2013) study confirms previous studies which show that Spain and Italy have experienced replacement migration (see also Billari 2008; Billari & Dalla-Zuanna (2011).

2.3 Critique of replacement migration

Espenshade (2001) is one of many opponents to the idea about replacement migration arguing that it should be more closely linked to social science and economics than simply suggesting increasing immigration (Espenshade, 2001 p. 383). Keely (2009) argues that migration is not an efficient solution to stabilize population sizes in comparison to pro-fertility policies. He argues that while the arrival of one migrant happens once, childbearing can contribute with more humans in societies. An example of pro-fertility policies is the parental allowance that

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[6] Another approach is *birth replacement*, which aims at understanding how births of immigrant contribute to the native birth cohorts (Wilson et al, 2013 p. 134).

[7] Billari's (2008) measurement is an example of that (Billari, 2008 p.14)

facilitates new parents' way back to the labour market. Parental allowance ought to encourage adults' own choice of the number of children, regardless of factors such as income or job opportunities (Lane, Spehar & Johansson, 2011 p.128). Also, Keely (2009) rejects the notion of migration as a solution for the demographic crisis on the one hand because there is no guarantee that female migrants are in their reproductive age or soon will be. On the other hand, he insists that an enormous supply of immigrants is not realistic in social, economic and political terms. Nevertheless, Keely (2009) means that higher immigration is one of several options for addressing the European states' societal problems due to shrinking population sizes (Keely, 2009 p. 397, 402).

2.4 Immigrants impact on fertility

The research on fertility and migration is filled with studies on the reversed causality: how immigration impacts fertility and childbearing trends both at a national level and on an individual level. For example at the national level, Sobotka (2008) found that immigrants' fertility patterns net effect on the overall TFR in European countries was around 0.1. It applied to Austria, France, Italy, Spain, Switzerland and the region of Flanders in Belgium around year 2000. In larger European cities immigrants' births have contributed to half of the total number of births. However, an impact of 0.1 TFR is rather modest, which means that many factors among native women also influence total fertility rates (Sobotka, 2008 p. 228-229).

At the individual level, studies have found that immigrant women tend to have higher total fertility rates than those of native populations in Europe, but there is a large heterogeneity amongst migrants depending on their culture of origin (Sobotka, 2008 p. 231, 233). During 2005-2018, immigrant Muslims had 62 percent higher levels of TFR than native European citizens, while native Muslims had 19 percent higher TFR (Stonawski Potančoková & Skirbekk 2016 p. 555-556). Stonawski et al. (2016) conclude that the socio-economic status of immigrant women explains their higher fertility levels to a greater extent than to the religious belonging, in this case, Islam (Stonawski et al., 2016 p. 562). Childbearing patterns are also shaped by the cause of migration. For instance, labour migrants usually follow native fertility patterns and postpone family formation due to career goals. While family reunification and refugee migration have shown higher fertility levels and slower adaptation to lower childbearing patterns of the host country. The decision to build a family is likely to be delayed until migrants reunify with their family members or when they are able to assure a better future in the new country (Murphy, 2016 p. 228; Simpson, 2017 p. 7; Stonawski et al., 2016 p. 553-554). Most studies have found that international migrant's fertility behaviour declines to levels close to rates among native women over time, but also for intra-European female immigrants (Murphy, 2016 p. 229) especially immigrants of the second and third generations (Keely, 2009 p. 397, 399; Sobotka, 2008 p. 236). These studies on the relation between migration and fertility shed light on how immigrants affect total fertility rates yet only to a small extent. Also, migrants tend to assimilate to the low native fertility patterns in European countries.

2.5 Determinants of migration

There are plenty of dimensions to what influences immigration and emigration. *Push and pull factors* are familiar terms in the research field of migration. Incentives behind migration depend partly on the circumstances that drive individuals to leave their home countries (push) simultaneously with the characteristics of the destination country, which in turn attracts migrants (pull) (Simpson, 2017 p. 3). Attributes of the origin countries that stimulate people to emigration are *poverty, low wages, unemployment, corruption, conflict/war, terrorism, insecurity/oppression* and *discrimination* (Simpson, 2017 p. 3; the World Bank Group, 2006 p. 78; Winter, 2019 p. 2-3). Well-known pull factors are e.g., *expected wage differentials*, *strong economic growth, differences in GDP per capita between countries, immigration policy* and *immigrant network* (Simpson, 2017 p. 3, 5; Winter, 2019 p. 18; the World Bank Group, 2006 p. 75, 92). The literature also discusses how *the welfare state* acts as a pull factor and is often referred as "the welfare state hypothesis". This implies that regions or countries attract immigration based on the generosity of the public transfer programs. The generosity is in turn referred to the share of social expenditures as percentages of GDP (Simpson, 2017 p. 5; Razin & Wahba, 2011 p. 28). One specific component for intra-European migration that can favour (also halt) migration is *positive expectations for economic growth*, which the candidacy and the membership of the EU often stimulate as the union work towards common sustainable economic goals (the World Bank Group, 2006 p. 91).

Determinants of migration are often divided into groups as economic and demographic, political (macro-level), social and cultural (micro-level). Winter (2019) examined the economic and political determinants of immigration from both inside and outside the EU-28 during 1998-2016. He claims that intra-European migration has mainly been driven by economic incentive rather than political whilst international migrants originating from outside

Europe are influenced both by economic and political incentives. He confirms that GDP per capita is substantially larger in destination countries than in countries of origin regardless of whether the migration is within or outside the EU (Winter, 2019 p. 18).

Following Winter's (2019) finding that GDP per capita is a robust determinant for migration rates in European states regardless of where the immigrants come from (Winter, 2019 p. 18) GDP per capita is included as a control variable in the current study. It is appropriate since the net migration rates used here do not distinguish between intra-European and international migration. The inclusion of GDP per capita is also necessary in order to avoid making false assumptions on how the focal relation between fertility and migration are associated.

2.6 The welfare state and demographic structure

This section will briefly highlight how the welfare state plays an important role regarding family formation and migration and thereby demographic structure.

One of the two goals with increasing immigration expressed by the UN (2000) was to stabilize the share of people in working-age. Up to this point, we know that both higher fertility levels and increasing immigration can mitigate shrinking cohorts of people in working-age in European societies. McDonald & Kippen (2001) pointed out another component: women's participation in the labour market. They prompted that higher fertility will contribute to demographic change in a medium-long term, while migration and women's participation operate in the shorter run (McDonald & Kippen, 2001 p. 22). The participation of women in the labour market also plays an important role for family formation. European states are divided in the literature into different types of welfare regimes and act in various ways to support the unification of work and family life with e.g. flexible working hours, paid parental leave, state-subsidised childcare and early education for children (McDonald, 2013 p. 992). McDonald (2013) explains the decreasing fertility levels in Europe as an outcome of the difficulties women have to balance work and family life, especially in urban areas in central, eastern and southern Europe. France and the Nordic countries' higher levels of fertility are explained by supportive family policies and the Nordic countries' gender egalitarianism has shown to encourage childbearing (McDonald, 2013 p. 991). Additionally, the welfare state can act as a pull factor to migration as mentioned in the section above (2.4). "The welfare magnet hypothesis" suggests that destination countries with helpful transfers might allure migrants' by the generosity of public assistance programs (Razin & Wahba, 2011 p. 29; Simpson, 2017 p. 5). Taking the dissimilarities between the countries into consideration in terms of welfare systems this study will control and make comparisons between the groups of countries. Thereby, we get a more refined insight into how the welfare groups might mitigate the association between fertility and migration.

3. Research question and hypothesis

This study aims to examine if and how net migration rate per capita is associated with total fertility rates. Both the UN and EU have suggested that increasing migrant inflows to EU countries might help deal with the European demographic crisis, i.e. ageing and shrinking population sizes. The consequences of the crisis are foreseen to challenge Europe's position on the global stage both as an economic powerhouse and as a provider of welfare services, as a smaller tax base will struggle to provide for growing cohorts of elderly who will require public services.

Research question

- Are fertility and migration rates associated among 27 European states in the years 1997 and 2017?

Hypothesis

H1: There is an association between total fertility rates and net migration rates per capita.

H0: There is *no* association between total fertility rates and net migration rates per capita.

4. Method and Data

The section of Method and Data discusses the choices of method and material. The selection of countries and years follows and furthermore operationalization of the dependent, independent and control variables. In the end, I illustrate models, brief the scientific premise and discuss further limitations.

4.1 The choice of regression analyses

I have chosen a quantitative method to grasp if and how fertility and migration levels correlate in European-level analyses due to the declining births the past decades. In order to examine whether fertility and migration rates associate I carry out a statistical design and make cross-sectional analyses at two points of time, 1997 and 2017 with data from the World Bank. Cross-sectional analyses capture data on relations at a certain point in time and will not tell us about changes over time nor are the coefficients comparable between the two years (Barmark & Djurfeldt, 2015 p. 42). I use linear regression analyses in which the independent variable is TFR and the dependent variable is net migration rate per capita, following Billari (2008 p.14) studies of replacement migration. In so doing, I aim to find to what extent fertility levels explain migration rates in two unexplored time periods within the research field. Linear regression analyses are chosen due to the continuous dependent variable, but also because all explanatory variables are either on ratio scale or dichotomous. Otherwise, I would have practised logistic regression analyses with an independent variable on a nominal or ordinal scale (Djurfeldt & Barmark, 2009 p.125). Linear regressions make it possible to examine the nature of associations (de Vaus, 2002 p. 279-280) and thus tell us if fertility and migration are associated and thereby reject the null hypothesis of no relationship**.**

I include three control variables to lessen the risk of getting spurious results of the relationship between fertility and migration. Since migration is determined by multiple factors and TFR is a rather uncommon variable in this context of migration studies control variables are added to isolate the effect that fertility rates potentially have on migration rates. I present and discuss the choice of the control variable further below.

It should be noted that the number of observations (n=27 each year) restricts the generalization of my findings. Previous research by Wilson et al., (2013) and Winter (2019) practised panel-data analyses that include more observations and makes it easier to draw conclusions out of the results. Panel-data or time-series analyses would have benefitted my analyses and tell us how fertility and migration rates associate over time, but is it both time consuming (Barmark & Djurfeldt, 2015 p. 42) and out of my academic knowledge. Nonetheless, I chose to run linear regression analyses as Billari (2008 p. 14) did between fertility and migration rates at a European-level.

Another way to tackle this topic would have been to make a qualitative textual analysis and investigate commentaries from European politicians about higher immigration as a solution to ageing and shrinking population sizes. Nonetheless, it would have been difficult to collect material from politicians from different parties in all the 27 member states chosen here. Moreover, it would have not given us an understanding of how fertility and migration are statistically related, which this study aims to do.

4.2 The World Bank database

The data for net migration rate and population, TFR, and GDP per capita is drawn from the institution of global statistic *the World Bank Open Data* (https://data.worldbank.org/). This international institution of statistical data aims to provide high-quality data by supporting national statistical systems and make data comprehensive. The data derived both from official national statistics, in this case, European national statistic bureaus, and through their own publications where they adjust fiscal/calendar-year differences. The World Bank uses data often via Eurostat, which is the case for the total fertility rates here except for Cyprus, which data instead were collected from United Nations Population Prospects (the World Bank data, 2017a). Eurostat's demographic statistics is also one of the six sources behind data on total population[8] (the World Bank data, 2019). An option would have been to use OECD, Eurostat or national statistics on migration rates, but Eurostat and OECD do not calculate net migration rate but keep immigration, emigration and refugee migration separate. Yearly data of GDP per capita derive also from the World Bank database in collaboration with OECD National Accounts data. Other options would have been to collect data from Maddison project, Penn

[8] The other sources behind population data by the World Bank: (1) United Nations Population Division. World Population Prospects: 2019 Revision. (2) Census reports and other statistical publications from national statistical offices, (3) United Nations Statistical Division. Population and Vital Statistics Report, (4) U.S. Census Bureau: International Database (the World Bank data, 2019)

World Table or the OECD database itself, but none of these institutions facilitates data of GDP per capita for all the chosen countries both years. Besides, the data by the World Bank database is accessible and comprehensive which fits my study of 27 countries very well. However, the institution work with aggregated data so the user has to be cautious when combining data due to differences in definitions, timing and reporting practices that can lead to inconsistencies. In order to increase the reliability of this study and consider the importance of intersubjective research (Esaiasson et al., 2017 p. 25, 64), I present a table of frequencies with data from the World Bank under Appendix 2.

4.3 Selection of countries and years of analysis

This study aims at focusing on the EU-28 member states. However, after running several analyses I omitted *Luxembourg.* The country is an outlier due to its high GDP per capita and sensitivity for net migration rates divided by its small population size, which affected the results[9]. The 27 selected countries here are *Austria, Belgium, Bulgaria, Croatia, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden* and *the United Kingdom*.

The decision of the two years *1997* and *2017*[10] is based on several aspects regarding fluctuations of migration rates rather than levels of TFR as the fertility levels in most EU countries have been below replacement levels in the past 20 years (World Bank, 2017a; 2017b). The two years, 1997 and 2017 capture two time periods before and after large-scale migration flows from outside but also within Europe. In the early 1990s borders broke down in the aftermath of the fall of the Iron curtain that caused large migration flows. In the 2010s the global financial crises that outburst during 2007-2008 (and later the euro crisis) led to a reduction of international immigration to Europe and changed intra-European migration streams[11] (de la Rica et al., 2015 p. 1304, 1307). Later on, in 2015 the so-called refugee crisis

[9] Appendix 3 and 4 present models including Luxembourg. GDP per capita correlated frequently positively with net migration rate per capita and caused one spurious results of the focal relation.
[10] My analyses of 1997 refer to lagged fertility levels from 1992 and migration stock between 1st of July 1995 - 30th of June 2000. 2017 compute lagged fertility levels of 2012 and migration stock between 1st of July 2015- predicted rates until 30th of June 2020 (the World Bank data, 2017b).
[11] The traditional East-West intra-EU migration transformed to more South-North migration streams (de la Rica et al., 2015 p. 1307).

took place, which increased the international immigration flows to some European states immensely (Winter, 2019 p. 2). Besides, one important similarity between 1997 and 2017 is the characteristic of recovering from economic crises.

World Bank data also contains five-year estimates of migration for 2002, 2007 and 2012. Previous studies have investigated migration from the beginning of the 2000s to a great extent due to Italy and Spain's very high rates of immigration and very low levels of fertility (Billari, 2008; Billari & Dalla-Zuanna, 2011). Therefore, I chose to examine a time period slightly earlier. I chose to leave 2007 and 2012 out due to the restrictions old member states implemented after the EU-enlargement in 2004 with 10 new member states mostly from Eastern Europe. Following the enlargement of the EU in 2004 western, southern and northern Europe countries feared from mass immigration from East. Most EU-15 countries implemented restrictions on the right to work for the new member state until 2007-2008, which in some cases were kept in place until 2014 (de la Rica et al., 2015 p. 1308-1309). Based on these migration restrictions that limit the movement of people I decided to examine 2017, which also is the latest data from the World Bank on net migration rates.

4.4 Operationalization of variables

The following section describes first the dependent and independent variables and then the control variables.

4.4.1 Net migration rate per capita

To operationalize the dependent variable, net migration rate per capita, I divided the net migration rate by the total population size of each country each year in order to match the other variables (TFR is divided by women in cohorts and GDP per capita by citizens). Migration is the demographic pillar that is most unstable because a person can migrate multiple times, in comparison to fertility and mortality. In addition, countries' have different definitions of various types of migrants (Ediev, Coleman & Scherbov, 2014 p. 624). The data for net migration rate include migration *stock* rather than *flows*. Stocks are the number of migrants within a country or region at a certain point of time, while flows are the numbers crossing a boarder during a time period (Eurostat, 2003)[12]. The World Bank (2017b) subtracts immigrants with emigrants, includes both citizens and non-citizens within a five-year period (World Bank, 2017b). Consequently, the measurements are the total sum of migration stock for 1995-2000 and 2015-2020. An alternative would have been to make average measurements by dividing the total net migrations rate by 5 years and thereby get annual migration stocks, but the reliability would be questionably as the quantities would not have been entirely correct.

Total population estimates are based on national population censuses and summarize data for demographic structure and changes in mortality, fertility and migration. The definition of population is 'all residents regardless of legal status or citizenship'. The values here are midyear estimates and one limitation is that of national statistics offices' different ways of collecting and defining population data (the World Bank data, 2019). To exemplify my operationalization in the case of Germany, the migration stock for 1997 (1995-2000) is 695914 and divided by a population size of 82 million the net migration rate per capita equals 0,8 percent. In the regressions the 1-unit step for net migration rate per capita is 0,025 in 1997 and 0,020 in 2017.

4.4.2 Total Fertility Rate

The values for the independent variable Total Fertility Rate (TFR) refer to births per woman during her reproductive years (mostly between 15 and 49), and have two dimensions: the number of births within an age-specific group, and the number of women in different cohorts. This implies that TFR might in certain cases decrease due to an increase in the mother's cohort without any practical change in the number of births. The postponement of births among European women also causes tempo-effects in TFR, which can lead to very low levels statistically for one year, but will be even out in the future when these older women in their reproductive years decide to have children (van Nimwegen & van der Erf, 2010 p. 1363). A crucial part is to take the effect of time into account, therefore the variable TFR is lagged by 5

[12] It should be noted that data on immigration flows from the World Bank could have been a better measurement of migration levels. However, flows are more fluent, while stocks is a more reliable measurement of how many migrants that actually have settled down in the source country. An alternative would have been to compile a dataset myself from Eurostat and the World Bank to assure international and intra-European migration flows. I decided however that the best alternative is to use the net migration rate from World Bank of migration stock divided by the size of the population.

year in average. For instance, the analyses for 1997 constitute the TFR in 1992 and the total average of net migration rate per capita 1995-2000**.** It is implausible that European countries will suddenly raise their net migration rates because of lower birth trends the year after. 3 to 8-year intervals are a rather short time for states to change migration or family policies. However, by the time this study begins European countries were well aware of their low fertility levels that had decreased since the 1970s before UN (2000) and the EU Commission (2006) published their reports.

This study will investigate whether the alarming low fertility levels have had an impact on net migration rate per capita among twenty-seven European countries. In this regard, TFR is appropriate since it is comparable and a traditional measurement for fertility (Ediev et al., 2014 p. 623). If this study intended to make a demographic prognosis, examine replacement migration, or to check impacts for different groups of the population then TFR would have been needed more elaboration. In the regressions, the 1-unit step for the predictor variable TFR is 0,25 in 1997 and 0,2 in 2017.

4.4.3 GDP per capita

The multiple regression analyses will control for Gross Domestic Product (GDP) per capita in US dollars. Winter's (2019) findings clearly showed how gaps in GDP per capita determine migration regardless immigration to the EU member states from countries within or outside of EU (Winter, 2019 p.18) making the use of GDP per capita important as a control variable for net migration rate that does not separate the origin of migrants. GDP per capita is reduced here by 1000, divided by the midyear population and comprises the sum of a country's total gross value of goods and services produced annually. The GDP per capita is based on *nominal* GDP, which do not make deductions for depreciation of fabricated assets. Neither for depletion nor degradation of natural resources which *real* GDP does (the World Bank 2017c). GDP per capita is sometimes criticized for being unstable measurement, especially when comparing countries since it is uncertain what counts as products and services. Also, GDP is often criticized for giving robust results for living standard in comparison to Human Development Index (HDI). Instead GDP should simply be seen as a statistical measurement for economic development comparing the growth over time (Sandelin, 2014 p. 69, 93, 95). Winter (2019) discusses differentials in GDP per capita between destination and sending countries as worse or better *economic conditions*. This being said, for the current study GDP per capita is appropriate as it is being used as a proxy for economic development level. The 1-unit step in the analyses is 20,00 for 1997 and 2017 (20 000 US Dollars).

4.4.4 EU-membership

The impact of EU membership on migration rates is pivotal to consider here due to the selection of countries and years. In 1997 only fifteen states were members out of the twenty-eight member states in 2017. The EU-enlargement in 2004 set off a whole new basis for intra-EU migration flows with ten new member states, mostly new democracies and post-communistic states from the former Soviet Union. After 2007 Bulgaria and Romania also accessed the union and thereby the European market (de la Rica et al., 2015 p. 1304, 1307). During the last twenty years, migration streams from Eastern to Western Europe among EU member states have been shaped mainly by economic determinants as unemployment and GDP differentials (Winter, 2019 p. 35). What we know in addition is that, that the candidacy and EU participation may impact migratory flows in terms of prospects of economic growth and work opportunities (the World Bank Group, 2006 p. 91). Hence, EU membership will be controlled as a dummy variable for 1997 and not later in 2017 because all countries were member states at that time. EU-membership is used as a dummy variable in Table 5.2. Membership has the value of 1 and non-membership equals 0. Figure 4.1 elucidates the member and non-member states of the EU.

Figure 4.1 Non-member and member states of the EU

Year	Member states of the EU
1997	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Ireland, (Luxembourg), the Netherlands, Portugal, Spain, Sweden and the United Kingdom. **EU-15**
2017	EU-15 + Bulgaria, Cyprus, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovak Republic, Slovenia and Romania **EU-28**

(European Union, 2019)

4.4.5 Welfare state regime type

The final control variable is the categorical variable welfare state regime type that I coded to dummies. With the inclusion of welfare state regime type we are able to make a comparison between the groups of countries. Both migration and social policies are areas of legislation on a national level within the EU and type of welfare state is therefore included in the study to give us a more disaggregated insight of whether fertility and migration associate related to that of an aggregated European-level.

The typology used here is inspired by three scientific publications. Firstly, the archetypical publication of three types of welfare regimes by Esping-Andersen's (1990) after the post-war era in 18 OECD countries based on the level of decommodification[13] and stratification[14]. Secondly, Ferrera's (1996) study which extents the former categorizing by including a *southern* regime type dedicated to countries in the southern Europe as one separate group. Therefore, Italy belongs to Ferrara's "southern regimes" and not to Esping-Andersen's "conservative regimes". Thirdly, Orenstein & Hass (2005) distinguish *post-communist* welfare regimes between Euro-Asian and European. The European post-communist welfare regimes were used here and fits the study very well since the group of European post-communist welfare states includes the Baltic countries, east-central European countries and former Yugoslav republics. Therefore I use the following categorization:

Figure 4.2 Welfare state regime types

Welfare state regime type	**Countries**
Social democratic (3)	Denmark, Finland and Sweden
Liberal (2)	Ireland and the United Kingdom
Conservative (5 used here)	Austria, Belgium, Germany, France, (Luxembourg) and the Netherlands
Southern (6)	Cyprus, Greece, Italy, Malta, Portugal and Spain.
Post – Communist (11)	Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic and Slovenia.

Esping-Andersen (1990); Ferrera (1996); Orenstein & Hass (2005)

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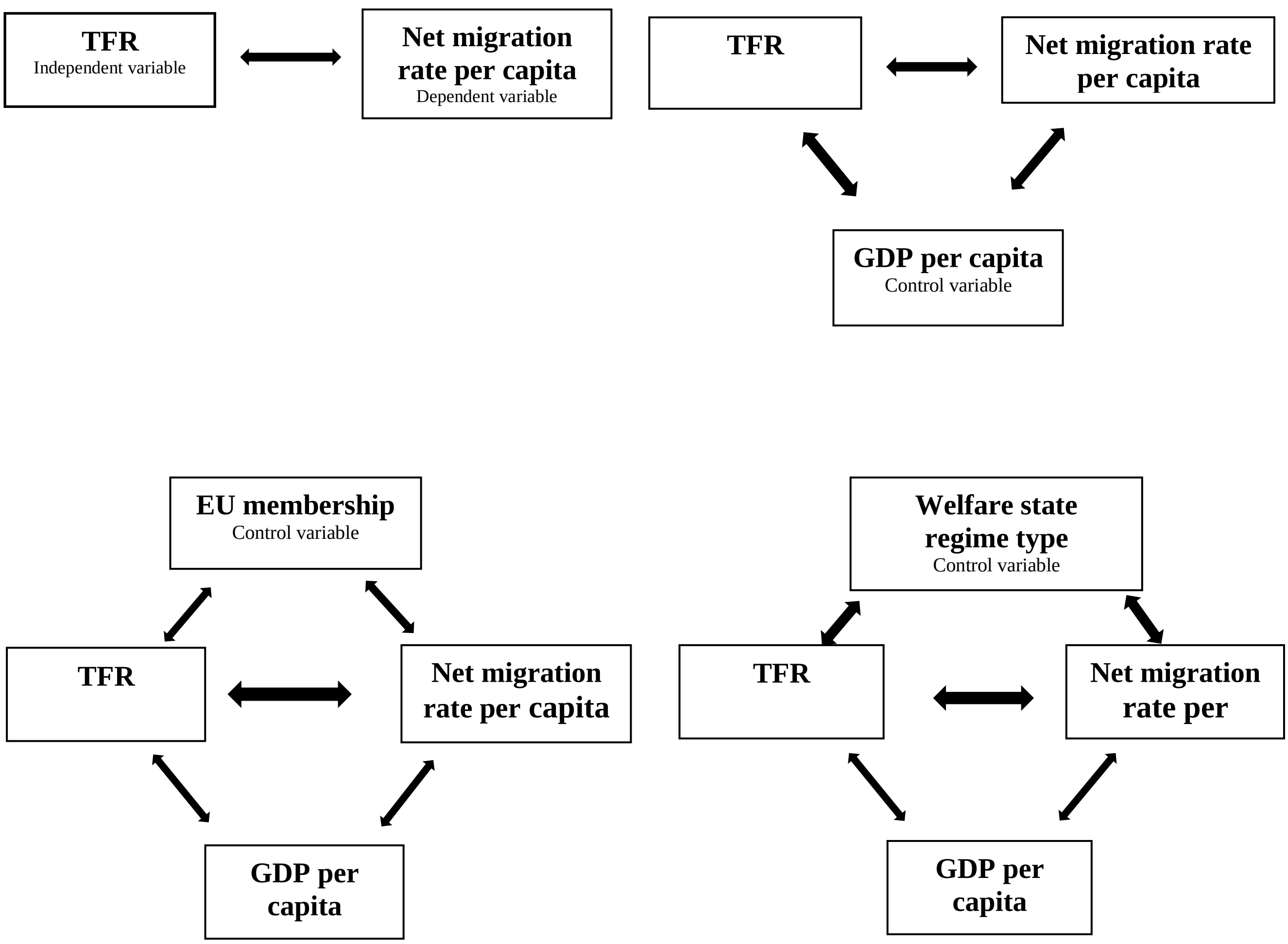
[13] Decommodification: Whether services irrespective of a job or not are provided for citizens mostly by the state as in *social democratic* regimes, by the market as in *liberal* regimes or family as in the *conservative* regimes.
[14] Stratification: the extent of the inequality of the society as an effect of how the welfare is organised (Berg & Spehar, 2011 p.65).

The Nordic countries make up the group of social-democratic regimes where decommodification and stratification are mostly provided by the state. Therefore, I chose social-democratic regimes as reference category because I assume these countries have rather high levels of social spending as percentages of GDP *as a total group* and fit the pull factor "welfare state hypothesis", which implies how the generosity of welfare expenditures attracts immigrants (Razin & Wahba, 2011 p. 29; Simpson, 2017 p. 5).

4.5 Causal models [15]



[15] This study cannot claim the causality between the variables, therefore are the arrows in both ways.

4.6 Scientific premise

This study has the aim of empirically *describe* how fertility and migration rate associate in contrast to *explain*. With this in mind, the reasons behind the results will be carefully interpreted by using explanations from the previous research. This study has a deductive approach with a presupposed hypothesis and investigates if the null hypothesis can be rejected or not (Bryman, 2016 p. 47; Esaiasson et al., 2017).

4.7 Discussion of Limitations

There are several limitations regarding my research on fertility and migration. The use of net migration rate might be problematic as it does not take into account the different types of migration: labour migrants, family reunification, asylum seekers, or irregular migration nor consider, international vs. intra-European migration (Spehar & Berg, 2011 p. 206). I could have improved my study by using rates of labour migration, however, the statistical office of the European Community (Eurostat) does not contain this data, so I decided to run regressions with net migration rate. Labour migrants would be more appropriate to address the aspect of smaller cohorts in working-age. Besides these aspects of the validity of this study, I attach a table of frequencies in Appendix 2 to be transparent and thereby produce good reliability. In addition, my study does not control for migration policies, which naturally impact migration flows to a great extent. Winter (2019) mentions the lack of comparative studies of migration policies and did not include it himself. Migration policies vary significantly within the EU, and no comprehensive index of migration policies is at hand.[16] Finally, the comparison of welfare state regime types makes the samples very small and uneven. For example, the eastern post-communist regimes are 11 and the social-democratic only 3. I decided however not to group regime types because they differ substantially and because I wanted to avoid producing biased results.

[16] The International Migration Policy of Law Analysis (IMPALA) work at the moment on data which can compensate the differences to make it possible to compare migrant groups in the shortcoming future (Winter, 2019 p. 34).

5. Results

The results section presents two analyses separately for the years 1997 and 2017. The first table includes five models for 1997 in table 5.2, whilst there are three models for 2017 in table 5.3 because EU membership cannot be controlled for. The tables include first simple regression analysis for the association between (lagged) TFR and net migration rate per capita, then multiple regression analyses are presented in which I control for GDP per capita, EU membership (only in 1997) and type of welfare state regime. Before we look at the simple and multiple regression analyses I present descriptive statistics of the continuous variables.

5.1 Descriptive statistics

Table 5.1 presents the mean values, standard deviation, minimum and maximum values for the variables on ratio scale. The dependent variable net migration rate per capita, the independent variable TFR and one of the control variables GDP per capita.

Table 5.1 Descriptive statistics: Lagged Fertility, GDP per capita and net migration per capita.

Univariate statistics	N	Mean	Std. Deviation	Min.	Max.
		1997			
Lagged TFR	27	1,698	0,274	1,29	2,34
GDP per capita*	27	14,778	10,430	1,35	32,84
Net migration rate per capita	27	0,004	0,019	-0,041	0,059
		2017			
Lagged TFR	27	1,558	0,222	1,28	2,01
GDP per capita*	27	30,075	16,273	8,03	69,33
Net migration rate per capita	27	0,004	0,010	-0,025	0,022

Source: the World Bank Data 2017a; 2017b; 2017c; 2019.
Observed data: 54 (N)
* GDP per capita reduced by 3 decimals

Table 5.1 presents the central tendency and dispersion of the variables using the mean and standard deviation for the 27 countries. The mean value of lagged TFR is on average higher in 1997 reaching almost 1.7 births per woman, relative to 1.56 in 2017. The averages show the trend of “below replacement” in Europe as the literature discusses (Baird et al., 2010 p. 592; Billari, 2008 p. 2; Lutz & Skirbekk, 2005 p. 699). The variation of lagged TFR decreases from 1997 to 2017, which can be seen by looking at the minimum and maximum values and the size of the standard deviation. The min-values are nearly the same, while the max-value has decreased which is a sign of convergence between the states in terms of childbearing patterns. In 1997 Germany had the lowest TFR (1,29) and Cyprus the highest (2,34), while in 2017 Portugal had the lowest levels of fertility (1,28) and France had the highest (2,01)[17].

The mean levels of economic development as measured by GDP per capita in US dollars have increased from 14,7 in 1997 to 30,0 in 2017 among the countries. The dispersion is narrower in 1997 than to that in 2017 when the difference between rich and poor countries were bigger. Bulgaria had the lowest level of development in both years, Denmark the highest GDP per capita 1997 and Ireland had the highest level among the countries in 2017[18].

The mean values for net migration rates per capita are the same for both years. In other words, the migrant stock constitutes 0,4 percent of the total population size of the 27 countries and it signals that the five-year estimated migrant stock has followed the size of the total population after many eminent migration streams in Europe looking at the values in 1997 and in 2017. The dispersion of net migration rate per capita in 1997 shows how countries’ values deviate more from the average than in 2017. The states’ net migration rate per capita differed more from each other in 1997 in terms of minimum and maximum values with Croatia’s high emigration rate (-4,1 percent) and Cyprus’s high immigration rate (5,9 percent). In 2017 Latvia the highest levels of emigration (-2,5 percent) while Germany had the highest share of immigrants relative to its population (2,2 percent)[19 20].

[17] Descriptive statistics including Luxemburg do not differ for the lagged TFR variable.
[18] Luxembourg pushed the statistics a lot for both years. For example, Luxembourg’s GDP per capita 2017 was 104,10 compare to the second-highest (Ireland) rate of 69,33.
[19] Luxembourg had the highest net migration per capita in 2017 of 4,1 percent.
[20] In 1997 eight countries experienced net emigration rates and nineteen countries net immigration rates. The division of countries is the same in 2017 however Portugal turned to emigration country and the Slovak Republic from emigration to immigration country instead. See Appendix 2.

5.2 Fertility and migration rates 1997

Table 5.2 presents five models with b-coefficients, the constant, R^2 and adjusted R^2. Due to the very small sample of 27 observations the level of significance is 0,1. Nevertheless, P-values of 0,005 and 0,001 are also presented because some results these levels of significance. Adjusted R^2 will be interpreted as the degree of explanation to net migration rate per capita instead of analysing the R^2 value as a further consequence of the small sample (Barmark & Djurfeldt, 2015 p. 142).

Table 5.2 Model Summary and Coefficients: Multiple regression analyses year 1997. Dependent variable: Net migration rate per capita

Regression analyses	Model 1	Model 2	Model 3	Model 4	Model 5
	1997	**1997**	**1997**	**1997**	**1997**
Lagged TFR	0,019 (0,014)	0,020 (0,012)	0,028* (0,014)	0,029 ** (0,011)	0,027 (0,16)
GDP per capita		0,001** (0,000)	0,000 (0,001)	0,002 (0,001)	0,001 (0,001)
EU membership[21]			0,017 (0,016)		-0,003 (0,018)
Welfare state regime (social democratic as ref.cat)					
Liberal				0,014 (0,013)	0,014 (0,013)
Conservative				0,014 (0,11)	0,014 (0,012)
Southern				0,046 ** (0,019)	0,044 * (0,021)
Post-Communist				0,024 (0,027)	0,020 (0,035)
Constant	-0,027	-0,041	-0,053	-0,090	-0,083
R^2	0,068	0,276	0,311	0,664	0,715
Adjusted R^2	0,030	0,215	0,221	0,563	0,615

Source: own estimates from the World Bank Data 2017a; 2017b; 2017c; 2019.
N = 27
Significance levels: * = p <0,1 ** = p <0.05 *** = p <0.01
Standard error of coefficients in brackets

[21] The variable is coded 0= non-members state, 1 = member state.

In model 1 we can see that TFR has a positive effect on net migration rate per capita. However, the coefficient is not significant and the adjusted R^2 is very low: 3 percent. That indicates that TFR does not associate alone with net migration per capita. In the next model GDP per capita is added as a control variable and it shows a very small positive significant correlation. However, it increases the adjusted R^2 up to 21,5 percent, which signals that the GDP per capita is one determinant to migration rates in European states as the literature discusses. Yet, the coefficient for TFR is not significant in model 2.

In model 3 we add EU membership as another control variable. The coefficient has a positive value, which indicates that the EU member states in 1997 associate with higher levels of net migration rate in comparison to the other European countries however it is not significant. GDP per capita turns insignificant and has the value of zero when adding EU membership. It is most likely due to the fact that the division of EU member states and non-members are on the one hand similar to the division of countries into high and low economic development and take out the effect in model 3. On the other hand, the variation gets even smaller causing the insignificance for GDP per capita. However, by adding EU membership the positive coefficient for TFR becomes significant on a level of 90 percent and the total model has a degree of explanation of just above 22 percent.

In model 4 the variable for EU membership is excluded and the type of welfare state regime added. The level of significant increases for TFR from 90 percent to 95 percent and the coefficient is slightly more positive. GDP per capita remains insignificant and the model has an adjusted R^2 value of 56 percent. Of all welfare state regime types, only southern regimes are significant on a level of 95 percent in a positive correlation. By this, we can simply see higher levels of migration per capita in southern regimes relative to the social-democratic states. The other groups of welfare state regimes turns insignificant, but we can however see that the groups do not differ to a great extent in terms of their migration levels from the social-democratic countries. These findings of positive associations in Model 3 and 4 is a result of Malta and Cyprus's strong effect in the analysis. When excluding the two countries there are in fact no associations between (lagged) TFR and net migration rate per capita in 1997. Both countries belong also to the southern regime types and lead to significant results of higher net migration rate per capita relative to the social-democratic regime type in Table 5.2. However, once we exclude the two countries the positive associations turn insignificant (see Appendix 5).

Finally, in model 5 both EU membership and welfare state regime type are included. Yet, only the coefficient for southern regimes is significant, which implies simply that southern regimes have the highest net migration rate per capita among the groups of countries. The adjusted R^2 for the model is 61,5 percent. The insignificant TFR in model 5, also model 1 and 2, tell us that fertility and migration do not associate in 1997 once controlling for GDP per capita, EU membership and type of welfare state regime, which means that other factors are shaping migration rates in Europe such as differences in GDP per capita as model 2 confirms.

Three out of five models in 1997 led to insignificant results of the focal relationship and that lead us to adopt the null hypothesis. Model 3 and 4 carry out statistical significant positive association between lagged fertility and net migration rate per capita nevertheless and hereby I cannot reject the null hypothesis of no association between fertility and migration rates. However, when omitting Malta and Cyprus there is no statistical significant association amongst the other twenty-five European countries (see Appendix 5).

5.3 Fertility and migration rates 2017

Table 5.3 presents three models with b-coefficients, the constant, R^2 and adjusted R^2. As stated before, the level of significance is 0,1 and the adjusted R^2 value explains the variation of net migration rates per capita due to the small number of observations (Barmark & Djurfeldt, 2015 p. 142).

Table 5.3 Model Summary and Coefficients: Multiple regression analyses year 2017. Dependent variable: Net migration rate per capita

Regression analyses	Model 6	Model 7	Model 8
	2017	**2017**	**2017**
Lagged TFR	0,012	-0,014	-0,010
	(0,009)	(0,011)	(0,014)
GDP per capita		0,001***	0,000
		(0,000)	(0,000)
Welfare state regime (social-democratic as ref.cat)			
Liberal			-0,001
			(0,008)
Conservative			0,001
			(0,007)
Southern			-0,005
			(0,012)
Post-Communist			-0,014
			(0,013)
Constant	-0,015	0,010	0,022
$\mathbf{R^2}$	0,065	0,400	0,498
Adjusted $\mathbf{R^2}$	0,028	0,350	0,347

Source: own estimates from the World Bank Data 2017a; 2017b; 2017c; 2019.
N = 27
Significance levels: * = p <0,1 ** = p <0.05 *** = p <0.01
Standard error of coefficients in brackets

Model 6 implies a positive correlation between TFR and net migration rate per capita in 2017, but it is not significant. The degree of variation is however very small, 2,8 percent which indicate that other factors impact migration in Europe rather than fertility levels. The coefficient for lagged TFR is in addition insignificant. In model 7 we can see how the coefficients for lagged TFR turn from positive to negative, which demonstrates the fragility of the statistical association. The association between GDP per capita and net migration rate per capita is significant with a level of 99 percent size and the effect is modest. TFR and GDP per capita explain together 35 percent of the variance in net migration rate per capita here and that is mainly due to the explanation of economic development levels on migration rates rather than fertility levels.

When adding all variables *lagged TFR*, *GDP per capita* and *welfare state regime type* together as seen in model 8 none of the coefficients remain significant. TFR is negative and insignificant and the effect of controlling for GDP per capita has also become insignificant. That is a result of how the division of welfare state regimes lessens the variation between the countries in terms of economic development and the sample decreases to, for example, only 2 in the case of liberal regimes. Values of the groups of welfare state show how social-democratic regimes had higher migration rate than to liberal, southern and post-communistic regimes, with the exception of conservative regimes that instead had higher levels. The adjusted R^2 is slightly lower, 34,7 percent, than model 7 that excludes welfare state regime type (35,0 percent). The welfare state as a control variable split in to group of countries does not help us explain migration rates in Europe in the year 2017. In conclusion, all the insignificant results in Table 5.3 lead us to adopt the null hypothesis. In other words, there is no association between fertility and migration in my study of 2017.

5.4 Summary of results

The main finding of this study is that of the majority of insignificant results over the focal relationship between fertility levels and net migration stock as percentages of the total population sizes among 27 European states both in 1997 and 2017. Nevertheless, lagged TFR and net migration rate per capita associate positively in 1997 when controlling for GDP per capita and the division of non-members and members of the EU. Together they explained 22 percent of the variation in net migration rate per capita among the EU countries. Lagged TFR and net migration rate correlated again positively when adding GDP per capita, and type of welfare state regime and explained 56 percent of the net migration rates per capita. We can also see how the six countries in South Europe had higher level of net migration rate per capita in 1997 relative to three Social Democratic states. In other words, countries with higher fertility levels showed to have a higher net migration rate per capita in two of the models of 1997, but the inclusion of all variables in 1997 shows how the positive association of fertility and migration partly is spurious, but mostly a result of Cyprus and Malta's strong influences in the analyses (see Appendix 5). In 2017 all regressions were insignificant except from the result of a small positive correlation between GDP per capita and net migration rate per capita. All other findings of insignificant results reveal to us that fertility and migration do not associate in this current study.

6. Conclusion and Discussion

The purpose of this study was to understand whether fertility levels and migration rates associate due to suggestions for rising immigration based on the concerns about the emergence of very low fertility in European states. The research question and hypothesis were:

"Are fertility and migration rates associated among 27 European states in the years 1997 and 2017?"

H1: There is an association between total fertility rates and net migration rates per capita.
H0: There is *no* association between total fertility rates and net migration rates per capita.

Using linear regression analysis we are able to answer the question. The major pattern of my results is that of no association in 1997 and 2017 between total fertility rates (TFR) and net migration rates per capita. The only two cases in which the TFR had a significant association with net migration rates per capita were in 1997. In these two cases, contrary to Billari's (2008) findings my models illustrate that higher levels of fertility are associate with higher levels of migration. The study of Billari (2008) found that countries with the lowest fertility levels between cohorts experienced higher rates of net migration later on (Billari, 2008 p.14). My finding of positive associations do not replicate the study of Billari & Dalla-Zuanna's (2011) of birth-cohort replacement in country-specific cases, nor the study by Wilson et al. (2013) because of great dissimilarity of our operationalization of fertility and the type of methods used. To understand my uncommon results of positive associations we have to consider several authors. Wilson et al.'s (2013) study on population replacement that measuring countries separately finds that while France and Sweden had levels of migration that replaced "missing" births in younger cohorts over time, Bulgaria and Latvia did not have enough immigration to compensate the population decline in younger cohorts. Moreover, McDonald (2013) discusses how France and Sweden favour childbearing in terms of the encouragement of women in the labour market. Thereby we can suspect higher fertility levels in western and northern countries compare to eastern European countries. At the same time, we can assume higher migration rates in western and northern countries in 1997 firstly because of the East-West migration flows in Europe after the end of the Cold War (de la Rica, 2019 p. 1307). Secondly, by taking "the welfare state hypothesis" (Razin & Wahba 2011) into account established welfare systems in North, West and South of Europe could presumably work as a motive for the higher migration levels here in comparison to the newly democratized states in East. However, there is no empirical evidence in the literature for positive correlations when it comes to fertility and migration rates on a European-level. I can therefore not establish my findings but rather speculate.

The explanation of the positive associations between fertility and migration rate in 1997 is that of how specific countries affect these findings. The models are impacted strongly by Cyprus and Malta's high levels of lagged TFR (from 1992) together with high net migration rates per capita because of their small population sizes and high immigration due to their locations in the Mediterranean Sea. Billari (2008) did not include Malta and Cyprus but chose to measure the largest 21 European states in 2008 probably due to the smaller countries differences in fertility and migration than to the rest of the European states. This implies that the positive associations here should not be interpreted as a general finding of how fertility and migration associate in a European perspective, but rather a result of Cyprus and Malta's strong effects in the analyses. Once we take out Malta and Cyprus no associations appear between (lagged) TFR and net migration rate per capita in any model for 1997 (See Appendix 5).

As stated, the major finding is though that fertility levels do not affect migration rates. This suggests that other factors are instead shaping migration to European states, for example, the pull factors immigration policy, the welfare state and wage differentials among others, but also push factors like poverty, discrimination and unemployment (Razin & Wahba, 2011; Simpson, 2017; the World Bank Group 2006; Winter, 2019).

In fact, in my study two variables are related to the literature on pull and push factor. The first is *differences in GDP per capita*, which suggests that higher levels of economic development associate with higher migration rates (Simpson, 2017; Winter 2019; the World Bank Group 2006). In my models of GDP per capita and lagged TFR show a significant positive effect of GDP on migration levels both in 1997 and 2017. However, GDP per capita turns insignificant when including EU membership and welfare state regime type due to reduced variation in terms of GDP by EU membership and type of welfare state. The division of countries between non-members and members, and countries' levels of low or high economic development, are similar to each other and are therefore taking out the effect of each other. The welfare groups contain samples either of two, five, six or eleven countries compared with the social-democratic regimes of three countries, which lead to insignificant results of GDP per capita in the regression analyses.

The last finding and which is related to push factors is that of the six countries belonging to the southern welfare state regime type that had higher net migration rate per capita relative to the social-democratic regimes in 1997. This result corresponds to some degree with the push factors because of the geographical position of southern regimes with close borders to the African and Asian continents. It goes also in line with the previous discussions about high immigration flows to Italy and Spain around the 2000s by Billari (2008), Billari & Dalla-Zuanna (2011) and Wilson et al., (2013). Besides, Malta and Cyprus belong to the southern regimes and make us again consider the countries' impact in the analysis and the fact that no significant results appear for the types of welfare state when excluding the two countries (see Appendix 5).

Studies on migration and fertility levels often examine to what extent migration impact fertility levels since immigration naturally impacts the population size in destination countries as Sobotka (2008) and Stonawaski et al. (2016) present. Since I cannot claim the causality between fertility and migration my results can also be understood as if higher net immigration associate with higher levels of fertility. However, the study tried to address the causality to some extent using lagged fertility levels of five years. That means that the higher fertility levels in 1992 are associating with higher levels of migration rates for 1997 when including Malta and Cyprus (see Table 5.2). Besides, I decided to have migration as response variable as Billari (2008) even though the main line in previous literature do not mention fertility levels as an incentive of migration.

There are several reasons behind the majority of insignificant results in this study to discuss. One aspect is the very small number of 27 countries each year in the cross-sectional analyses and the observations get even fewer samples when grouping them into welfare regime types. In turn, this makes it difficult to generalize the results. Other quantitative studies on migration often examine trends over time and get thereby more observations. It is also more common to study fertility and migration at country or regional-levels contrary to the European level here and the variable of fertility is also often more elaborated than simply using total fertility rates (TFR).

Another aspect behind insignificant results is that the three control variables are few in terms of motives for migration. We cannot tell that these control variables do statistically associate with both total fertility rates and net migration rate per capita in previous research, which explain why the literature on migration and fertility, in general, is divided by studies on either replacement migration, migrants' impact on fertility or determinants of migration. My study does also exclude many known determinants of migration that could have benefitted our knowledge of how fertility might affect migration, for instance, immigration policy. However, we can also interpret my main finding as if these two pillars of demographic structure actually do not associate because states are not willing to increase immigration as a solution to low fertility levels as the critics Espenshade (2001) and Keely (2009) discussed.

I see how this study can evolve in many ways and will hereby propose ideas for further research. Today with documented data from the World Bank database it would be possible to renew Billari's (2008) study with the latest data of net migration rate from 2017 on the decrease of births between the cohorts in 1977 and 1997. In order to grasp a better understanding of the "welfare state hypothesis" and migration social expenditure as a percentage of the GDP could have been included. Another idea is to make panel-data analyses over the years 1997-2017 among these EU member states. That would resemble Winter's (2019) study where he claimed GDP per capita for being a determinant of international and intra-European migration to the EU-28 countries 1998-2016. By doing so I could examine if fertility levels can explain migration rates together with all the variables he used. It would also be interesting to study comprehensive data on migration policy from IMPALA in the shortcoming future and labour migration from Eurostat to expand the research field on migration within a European demographic context.

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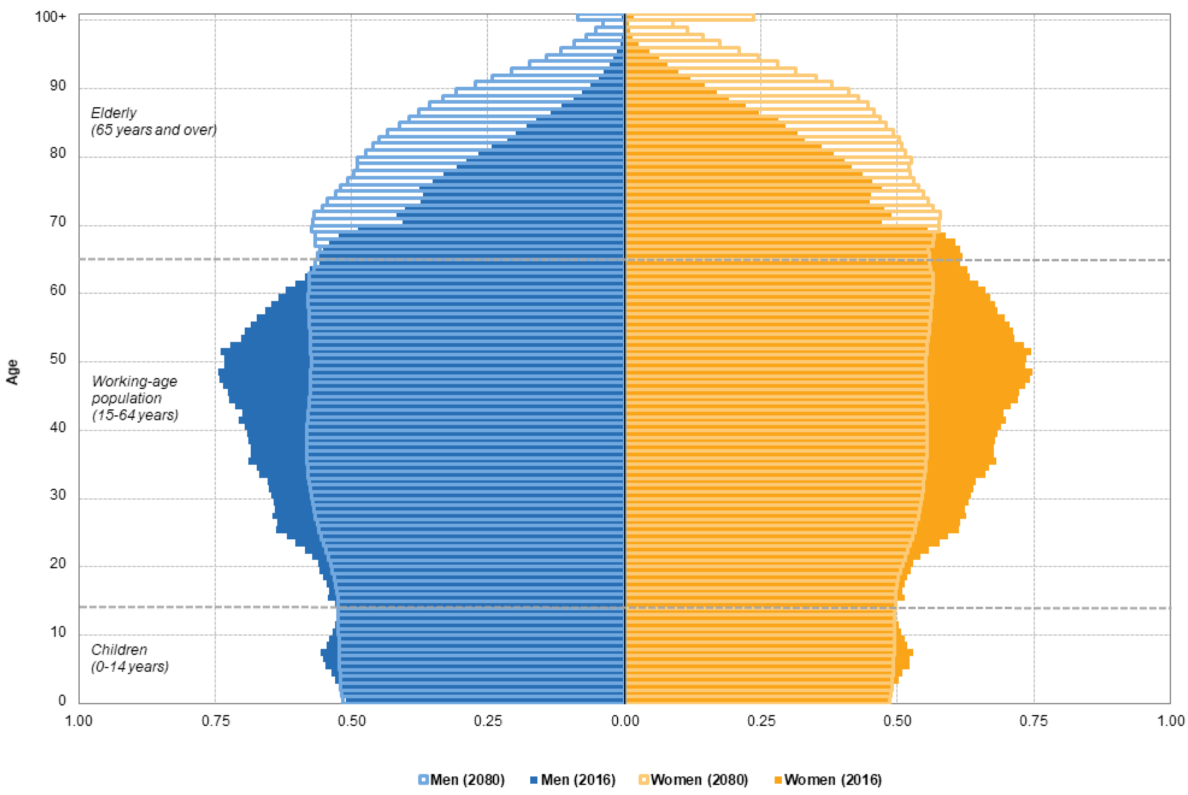
Appendix 1

Figure 1: Demographic pyramid 2016 and 2080 - The population of EU



Note: 2016, estimates. 2080: projections.
Source: Eurostat (online data codes: demo_pjan and proj_15npms)

Source: (Eurostat, 2017)

Appendix 2

Table 1: Tables of Frequencies

Average values for Total Fertility Rate (TFR), Lagged TFR, Net migration rate, Total population, Net migration rate per capita, GDP per capita and Welfare state regime types.

Country	Year	TFR	Lagged TFR	Net migration rate	Population	Net migration rate per capita	GDP per capita *	Regime type
Austria	1992	1,51		227841	7840709		24,88	Conservative
Austria	1997	1,39	1,51	65082	7968041	,0081679	26,71	Conservative
Austria	2017		1,44	99999	8797566	,0113667	47,29	Conservative
Belgium	1992	1,65		106947	10045158		23,50	Conservative
Belgium	1997	1,60	1,65	50870	10181245	,0049964	25,03	Conservative
Belgium	2017		1,79	240000	11375158	,0210986	43,32	Conservative
Bulgaria	1992	1,55		-356464	8540164		1,21	PostComm
Bulgaria	1997	1,09	1,55	-133824	8312068	-,0161000	1,35	PostComm
Bulgaria	2017		1,50	-24001	7075947	-,0033919	8,03	PostComm
Croatia	1992	1,48		-143579	4575818			PostComm
Croatia	1997	1,69	1,48	-188129	4534920	-,0414845	5,21	PostComm
Croatia	2017		1,51	-40000	4124531	-,0096981	13,29	PostComm
Cyprus	1992	2,34		43195	800611		11,31	Southern
Cyprus	1997	1,95	2,34	53260	891190	,0597628	14,30	Southern
Cyprus	2017		1,39	25001	1179680	,0211930	25,23	Southern
CzechRep	1992	1,71		29999	10319123		3,35	PostComm
CzechRep	1997	1,17	1,71	46002	10304131	,0044644	6,00	PostComm
CzechRep	2017		1,45	59997	10594438	,0056631	20,37	PostComm
Denmark	1992	1,76		65466	5171370		29,57	SocialDemo
Denmark	1997	1,75	1,76	74568	5284991	,0141094	32,84	SocialDemo
Denmark	2017		1,73	75998	5764980	,0131827	56,31	SocialDemo
Estonia	1992	1,71		-111876	1533091			PostComm
Estonia	1997	1,32	1,71	-1197	1399535	-,0008553	3,62	PostComm
Estonia	2017		1,56	-4999	1317384	-,0037946	19,70	PostComm
Finland	1992	1,85		47223	5041992		22,34	SocialDemo
Finland	1997	1,75	1,85	22154	5139835	,0043103	24,68	SocialDemo
Finland	2017		1,80	70000	5508214	,0012708	45,70	SocialDemo
France	1992	1,74		303416	58851217		23,81	Conservative
France	1997	1,77	1,74	382333	59964851	,0063760	24,23	Conservative
France	2017		2,01	400002	66865144	,0059822	38,48	Conservative
Germany	1992	1,29		2659698	80624598		26,33	Conservative
Germany	1997	1,35	1,29	695914	82034771	,0084832	27,05	Conservative
Germany	2017		1,41	1850000	82657002	,0223817	44,47	Conservative
Greece	1992	1,36		464636	10399061		11,18	Southern
Greece	1997	1,27	1,36	297431	10661259	,0278983	13,43	Southern
Greece	2017		1,34	49996	10754679	,0046488	18,61	Southern
Hungary	1992	1,77		99980	10369341		3,73	PostComm
Hungary	1997	1,37	1,77	78562	10290486	,0076344	4,60	PostComm
Hungary	2017		1,34	29999	9787966	,0030649	14,22	PostComm

Ireland	1992	1,99		-10648	3558430		15,73	Liberal
Ireland	1997	1,93	1,99	83412	3674171	,0227023	22,54	Liberal
Ireland	2017		2,00	23497	4807388	,0048877	69,33	Liberal
Italy	1992	1,30		152825	56797087		23,17	Southern
Italy	1997	1,21	1,30	223974	56890372	,0039369	21,78	Southern
Italy	2017		1,43	350000	60536709	,0057816	31,95	Southern
Latvia	1992	1,73		-116474	2614338			PostComm
Latvia	1997	1,11	1,73	-46601	2432851	-,0191549	2,68	PostComm
Latvia	2017		1,44	-50000	1942248	-,0257434	15,59	PostComm
Lithuania	1992	1,97		-100301	3700114			PostComm
Lithuania	1997	1,47	1,97	-93925	3575137	-,0262717	2,83	PostComm
Lithuania	2017		1,60	-25000	2828403	-,0088389	16,68	PostComm
Luxembourg	1992	1,64		20040	392175		40,97	Conservative
Luxembourg	1997	1,71	1,64	19940	419450	,0475384	47,04	Conservative
Luxembourg	2017		1,57	25001	596336	,0419244	104,10	Conservative
Malta	1992	2,11		3787	367618		8,22	Southern
Malta	1997	1,98	2,11	6378	382791	,0166618	9,68	Southern
Malta	2017		1,43	4501	467999	,0096175	26,95	Southern
Netherlands	1992	1,59		186409	15184166		23,60	Conservative
Netherlands	1997	1,56	1,59	178553	15610650	,0114379	26,40	Conservative
Netherlands	2017		1,72	80000	17131296	,0046698	48,22	Conservative
Poland	1992	1,95		-159999	38363667		2,46	PostComm
Poland	1997	1,51	1,95	-85199	38649660	-,0022044	4,12	PostComm
Poland	2017		1,33	-50002	37974826	-,0013167	13,81	PostComm
Portugal	1992	1,54		149122	9952494		10,81	Southern
Portugal	1997	1,47	1,54	173604	10108977	,0171733	11,58	Southern
Portugal	2017		1,28	-30001	10300300	-,0029126	21,14	Southern
Romania	1992	1,51		-520001	22794284		1,10	PostComm
Romania	1997	1,32	1,51	-610000	22553978	-,0270462	1,59	PostComm
Romania	2017		1,52	-150000	19587491	-,0076580	10,81	PostComm
SlovakRep	1992	1,93		-15108	5305016		2,91	PostComm
SlovakRep	1997	1,43	1,93	-2964	5383291	-,0005506	5,14	PostComm
SlovakRep	2017		1,34	4999	5439232	,0009191	17,60	PostComm
Slovenia	1992	1,33		-17461	1996498			PostComm
Slovenia	1997	1,25	1,33	1487	1985956	,0007488	10,45	PostComm
Slovenia	2017		1,58	6002	2066388	,0029046	23,60	PostComm
Spain	1992	1,31		319270	39157685		16,07	Southern
Spain	1997	1,15	1,31	905020	40057389	,0225931	14,70	Southern
Spain	2017		1,32	200000	46593236	,0042925	28,16	Southern
Sweden	1992	2,09		156460	8668067		32,34	SocialDemo
Sweden	1997	1,52	2,09	58470	8846062	,0066097	29,90	SocialDemo
Sweden	2017		1,52	200000	10057698	0,0198853	53,44	SocialDemo
UK	1992	1,79		205443	57580402		20,49	Liberal
UK	1997	1,72	1,79	498998	58316954	,0085567	26,62	Liberal
UK	2017		1,92	900000	66058859	,0136242	39,72	Liberal
N		56	56	84	84	56	84	

*GDP per capita reduced by 1000.

Source: World Bank data (2017a); World Bank data (2017b); World Bank data (2017c); World Bank data (2019); Esping-Andersen (1990), Ferrera (1996); Orenstein & Hass (2005).

Appendix 3

Table 2: Model Summary and Coefficients: Multiple regression analyses year 1997. Dependent variable: Net migration rate per capita

Regression analyses including Luxembourg					
	1997	**1997**	**1997**	**1997**	**1997**
Lagged TFR	0,029	0,019	0,022	0,029 **	0,028 *
	(0,015)	(0,012)	(0,014)	(0,010)	(0,16)
GDP per capita		0,001**	0,001	0,002***	0,002**
		(0,000)	(0,001)	(0,001)	(0,001)
EU membership			0,005		-0,002
			(0,013)		(0,017)
Welfare state regime (social democratic as ref.cat)					
Liberal				0,015	0,015
				(0,012)	(0,012)
Conservative				0,015	0,015
				(0,10)	(0,010)
Southern				0,048 ***	0,047 **
				(0,013)	(0,015)
Post-Communist				0,028 *	0,026
				(0,016)	(0,025)
Constant	-0,023	-0,042	-0,046	-0,097	-0,091
R^2	0,050	0,369	0,374	0,577	0,715
Adjusted R^2	0,013	0,319	0,295	0,503	0,615

Source: own estimates from the World Bank Data 2017a; 2017b; 2017c; 2019.
N = 28
Significance levels: * = p <0,1 ** = p <0.05 *** = p <0.01
Standard error of coefficients in brackets

Appendix 4

Table 3: Model Summary and Coefficients: Multiple regression analyses year 2017. Dependent variable: Net migration rate per capita

Regression analysis including Luxembourg			
	2017	**2017**	**2017**
Lagged TFR	-0,013 (0,011)	-0,013 (0,009)	-0,011 (0,014)
GDP per capita		0,001*** (0,000)	0,000 ** (0,000)
Welfare state regime (socialdemocratic as ref.cat)			
Liberal			-0,002 (0,008)
Conservative			0,004 (0,007)
Southern			0,001 (0,010)
Post-Communist			-0,006 (0,009)
Constant	-0,014	0,010	0,011
R^2	0,047	0,587	0,638
Adjusted R^2	0,011	0,554	0,534

Source: own estimates from the World Bank Data 2017a; 2017b; 2017c; 2019.
N = 28
Significance levels: * = p <0,1 ** = p <0.05 *** = p <0.01
Standard error of coefficients in brackets

Appendix 5

Table 4: Model Summary and Coefficients: Multiple regression analyses year 1997. Dependent variable: Net migration rate per capita

Regression analyses excluding Malta, Cyprus and Luxembourg					
	1997	**1997**	**1997**	**1997**	**1997**
Lagged TFR	-0,005 (0,015)	-0,005 (0,012)	0,005 (0,011)	0,018 (0,016)	0,018 (0,016)
GDP per capita		0,001** (0,000)	0,000 (0,001)	0,001 (0,001)	0,001 (0,001)
EU membership			0,032** (0,012)		-0,006 (0,028)
Welfare state regime (social democratic as ref.cat)					
Liberal				0,011 (0,012)	0,011 (0,012)
Conservative				0,009 (0,012)	0,009 (0,012)
Southern				0,031 (0,021)	0,031 (0,021)
Post-Communist[22]				0,006 (0,028)	-
Constant	0,010	-0,003	-0,018	-0,051	-0,045
R^2	0,005	0,340	0,512	0,572	0,572
Adjusted R^2	-0,038	0,280	0,442	0,429	,0429

Source: own estimates from the World Bank Data 2017a; 2017b; 2017c; 2019.
N = 25
Significance levels: * = p <0,1 ** = p <0.05 *** = p <0.01
Standard error of coefficients in brackets

[22] Please note that the division of post-communist countries are identical with the non EU member states in 1997 when excluding Malta and Cyprus. The two last models are therefore the same, except different values of the constant.

Appendix 6

Table 5: Model Summary and Coefficients: Multiple regression analyses year 2017. Dependent variable: Net migration rate per capita

Regression analyses excluding Malta, Cyprus and Luxembourg			
	2017	**2017**	**2017**
Lagged TFR	0,016*	-0,009	-0,012
	(0,009)	(0,010)	(0,013)
GDP per capita		0,001***	0,000
		(0,000)	(0,000)
Welfare state regime (social democratic as ref.cat)			
Liberal			-0,001
			(0,008)
Conservative			0,001
			(0,007)
Southern			-0,011
			(0,012)
Post-Communist			-0,015
			(0,012)
Constant	-0,022	0,003	0,027
R^2	0,118	0,458	0,543
Adjusted R^2	0,080	0,408	0,390

Source: own estimates from the World Bank Data 2017a; 2017b; 2017c; 2019.
N = 25
Significance levels: * = p <0,1 ** = p <0.05 *** = p <0.01
Standard error of coefficients in brackets